

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Currently Amended) A computer-implemented method for separating gingiva from a tooth on a computer model of the gingiva and the tooth, the method comprising:
 - defining a three dimensional closed cutting surface passing through a line between the gingiva and a crown of the tooth, the crown defining a volume, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of the root of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and
 - applying the cutting surface to the tooth to separate the gingiva from the tooth.
2. (Original) The method of claim 1, wherein the cutting surface is curved.
3. (Original) The method of claim 1, wherein the cutting surface is expressed as a function.
4. (Original) The method of claim 1, wherein the cutting surface is expressed as a spline function and a quadratic function.
5. (Original) The method of claim 1, wherein the cutting surface is expressed as a spline function and a parabolic function.
6. (Original) The method of claim 1, wherein the cutting surface is interactively adjusted.
7. (Original) The method of claim 4, wherein the interactive adjustment of the cutting surface modifies a function defining the cutting surface.

8. (Previously presented) The method of claim 4, further comprising interactively highlighting the separated gingiva.

9. (Previously presented) The method of claim 8, further comprising interactively highlighting a border of the separated gingiva.

10. (Original) The method of claim 1, wherein the cutting surface is defined by specifying a basis for the tooth.

11. (Original) The method of claim 1, further comprising finding a gingival line separating a tooth surface and a gingiva.

12. (Original) The method of claim 11, further comprising finding the high curvature location on the tooth surface.

13. (Original) The method of claim 11, further comprising fitting a spline to the gingival line.

14. (Original) The method of claim 1, wherein the cutting surface further comprises a plurality of surfaces.

15. (Original) The method of claim 14, wherein the root of the tooth is modeled as a parabolic surface below a gingival line.

16. (Original) The method of claim 14, further comprising defining an enclosing surface to enclose the crown of the tooth.

17. (Previously presented) The method of claim 14, further comprising:
displaying the cutting surface specified with a plurality of nodes;
adjusting one or more nodes to modify the surface; and
applying the surface to separate the gingiva from the tooth.

18. (Currently Amended) The method of claim 17, further comprising providing a handle to adjust ~~each~~an orientation of the cutting shape.

19. (Original) The method of claim 17, wherein adjusting one or more nodes further comprises moving one or more nodes.

20. (Original) The method of claim 17, wherein the cutting surface is formed using a function in a cylindrical coordinate system.

21. (Previously presented) A system for separating gingiva from a tooth on a computer model of the gingiva and the tooth, the system comprising:

means for defining a three dimensional closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of a root of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

means for applying the cutting surface to the tooth to separate the gingiva from the tooth.

22. (Previously presented) A computer program, residing on a tangible storage medium, for use in separating gingiva from a computer model of a tooth, the program comprising executable instructions operable to cause a computer to:

define a three dimensional closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of a root of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

apply the cutting surface to the tooth to separate the gingiva from the tooth in a single cut.

23. (Previously presented) A computer program, residing on a tangible storage medium, for use in separating gingiva from a computer model of a tooth, the program comprising executable instructions operable to cause a computer to:

define a three dimensional closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of a root of the tooth, and wherein the cutting surface is expressed as a spline function and a quadratic function, the crown portion of the closed cutting surface comprising a volume greater than the volume of the crown of the tooth; and

apply the cutting surface to the tooth to separate the gingiva from the tooth in a single cut.

24. (Previously presented) A computer, comprising:

a processor;

a data storage device coupled to the processor, the data storage device containing a computer program for use in separating gingiva from a computer model of a tooth, the program comprising executable instructions operable to cause a computer to:

define a three dimensional closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of a root of the tooth, and wherein the cutting surface is expressed as a spline function and a quadratic function, and wherein the cutting surface further comprises a plurality of surfaces, and wherein a root of the tooth is modeled as a parabolic surface below a gingival line, the crown portion of the closed cutting surface comprising a volume greater than the volume of the crown of the tooth; and

apply the cutting surface to the tooth to separate the gingiva from the tooth.

25. (Original) The system of claim 24, further comprising instructions to define an enclosing surface to enclose the crown of the tooth.

26. (Previously presented) A computer-implemented method for separating tooth from gingiva, comprising:

defining a three dimensional closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth and a root portion approximating the shape of a root of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

applying the cutting surface to the tooth to separate the gingiva and reconstruct the root for the tooth.

27. (Previously presented) The method of claim 1, further comprising:
visually displaying the cutting surface to a user as two surfaces representing opposed sides of the separation between the gingival and the tooth; and
allowing the user to determine whether to separate the gingival from the tooth.

28. (Previously presented) The method of claim 1, wherein the crown surface is modeled as a one or more functions.

29. (Previously presented) The method of claim 28, wherein the crown surface is modeled as a quadratic function in polar coordinates.

30. (Previously presented) The method of claim 1, further comprising allowing a user to change a shape of the crown surface.

31. (Previously presented) The method of claim 30, wherein allowing the user to change the shape comprises allowing the user to move at least one of crown control points, top control points and a gingival line.

32-36. (Canceled).

37. (Previously presented) A computer-implemented method for separating gingiva from a tooth on a computer model of the gingiva and the tooth, the method comprising:

defining a three dimensional closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

applying the cutting surface to the tooth to separate the gingiva from the tooth.

38. (Previously presented) A system for separating gingiva from a tooth on a computer model of the gingiva and the tooth, the system comprising:

a processor;

a data storage device coupled to the processor, the data storage device containing a computer program for use in separating gingiva from a computer model of a tooth, the program comprising executable instructions operable to cause a computer to:

define a three dimensional closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown portion surrounding the crown of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

apply the cutting surface to the tooth to separate the gingiva from the tooth.

39. (Previously presented) A computer program, residing on a tangible storage medium, for use in separating gingiva from a computer model of a tooth, the program comprising executable instructions operable to cause a computer to:

define a three dimensional closed cutting surface passing through a line between the gingiva and a crown of the tooth, wherein the closed cutting surface comprises a crown

Appl. No. 10/633,015
Amdt. dated March 23, 2009
Amendment under 37 CFR 1.116 Expedited Procedure
Examining Group 3732

PATENT

portion surrounding the crown of the tooth, and wherein the crown portion of the closed cutting surface comprises a volume greater than the volume of the crown of the tooth; and

apply the cutting surface to the tooth to separate the gingiva from the tooth in a single cut.